

VACUUM CHAMBER ASSEMBLY

BACKGROUND OF THE INVENTION

This invention relates to a vacuum chamber assembly constituting a part
5 of a device such as a sputtering device, a dry-etching device, a CVD device, a
vacuum furnace, etc., in manufacture such as semiconductor manufacturing,
flat-panel manufacturing and so on.

JP11-50229A discloses a vacuum chamber which can be used in a
semiconductor manufacturing system, in which a time for evacuating air after
10 changing consumption articles or after regular maintenance can be decreased.

In this vacuum chamber, joint portions are joined by means of welding,
soldering, etc, deformation due to the joint work are removed, and further, a
cutting operation or a grinding operation is carried out in order to increase an
airtight level. Furthermore, it is necessary to carry out a cleaning operation in
15 order to remove contaminations such as swarf, flux, etc. coming out of the
cutting operation or the grinding operation.

Besides, as shown in JP-11-50229A, the vacuum chamber constitutes a
part of the device such as a sputtering device, dry-etching device, a CVD device,
a vacuum furnace. However, up to now, a method, in which the device
20 including the vacuum chamber is assembled in a factory, and then transported
and arranged to a specific place, was carried out in order to maintain an airtight
level of the vacuum chamber.

However, since the vacuum chamber becomes larger as the device
becomes larger, it becomes difficult to transport and arrange the device after
25 assembling it in the factory, so that necessity such as to assemble the device on
a working spot such as a factory directly is yielded. As a result, though it is

desired to assemble the vacuum chamber on the spot, it is difficult to repair the deformation coming out of the work in case that the vacuum chamber is assembled by means of welding or soldering on the spot, so that any troubles are yielded in the airtight level of the vacuum chamber and a problem such that an operation for cleaning contaminations such as swarf, flux, etc. is very difficult is yielded. In the case of desiring extension, the extension must be given up because it is difficult to carry the device into the spot.

SUMMARY OF THE INVENTION

The object of the invention is to provide a vacuum chamber assembly which can be assembled on a spot such as a factory easily and extension of which is easy.

This invention is a vacuum chamber assembly which constitutes a part of a device such as a sputtering device, comprising at least a floor plate, an upper plate, a plurality of props standing on said floor plate to support said upper plate, and side plates for closing side opening portions between said props, characterized by that: first connected portions between the floor plate and the props and second connected portions between the upper plate and the props are fixed by screw fixing means; side surfaces of the floor plate, the props and the upper plate which constitutes circumferential edge portions of the side opening portions are provided with installation grooves respectively; a gasket which is unitedly constituted of side surface sealing portions which is installed in the installation grooves formed on the circumferential edge portions of the side opening portions respectively, and connection sealing portions for sealing the first connected portions and the second connected portions is provided; and the side plates are fixed to the circumferential edge portions so as to close the

side opening portions via the side surface sealing portions of the gasket respectively.

Furthermore, it is preferred that projections projecting along borderlines of the first connected portions and the second connected portions are formed respectively, and sealing grooves for engaging the projections are formed in the connection sealing portions of the gasket respectively.

Moreover, it is preferred that housing spaces for housing top portions of the gasket which is pressed by the side plates are formed along side lines of the installation grooves in the installation grooves, respectively. It is better that the housing spaces are formed along one of the side lines of the installation grooves or along both side lines of the installation grooves.

Furthermore, it is desired that the first connected portions and the second connected portions have housing grooves for the connection sealing portions of the gasket which are formed in an arc shape along respective connected portions, and the projections are formed so as to project into the housing grooves. Besides, it is desired that the housing grooves are formed in a size such as to be able to house top portions of the connection sealing portions of the gasket which are pressed and deformed by the side plates.

Moreover, the side plates have at least equipment for windows, equipment for piping for intake or discharge, equipment for wiring harness, etc.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an explanatory diagram of a framework of a vacuum chamber assembly according to a working mode of the present invention;

Fig. 2 is an explanatory diagram showing a condition in which a gasket is installed to the framework of the vacuum chamber assembly according to a

working mode of the present invention;

Fig. 3 is an explanatory diagram showing a condition in which the vacuum chamber assembly according to the work mode of the present invention is completed;

5 Fig. 4 is a partial enlarged explanatory diagram of a connected portion which is between a floor plate and one of props or between one of props and an upper plate;

Fig. 5 is a partial enlarged plan view of the connected portion;

Fig. 6 is a partial cross section of the prop;

10 Fig. 7 is a partial cross section of a side sealing portion of the gasket and an installation groove;

Fig. 8 is a partial cross section of a connection sealing portion of the gasket and a connected portion;

15 Fig. 9 is a partial cross section of another working mode of a side sealing portion of the gasket and an installation groove; and

Fig. 10 is an explanatory diagram showing a condition in which the vacuum chamber assemblies are provided in series.

THE PREFERRED EMBODIMENT OF THE INVENTION

20 Hereinafter, a working mode of this invention is explained by referring the drawings.

A vacuum chamber assembly 1 according to the present invention constitutes a part of a device such as a sputtering device, dry-etching device, a CVD device, a vacuum furnace, etc. for instance, a sputtering mechanism
25 comprising a substrate, a target, etc., is located inside thereof, and a pump for vacuuming, a control unit, etc., are provided outside thereof, so that a sputtering

device is constituted as a whole (not shown in drawings).

Firstly, in thus vacuum chamber assembly 1, as shown in Fig. 1, a framework 9 is constituted of a floor plate 2 on which the device is installed, a plurality of (four in this working mode) props 3 standing on the floor plate 2 and an upper plate 4 supported by the props 4 so as to surround a space 50 in which the device is located.

It is desired that assembling the framework 9, as shown in Fig. 4, is carried out by that projecting portions 31 formed at ends of props 3 are engaged into concave portions formed in the upper plate 4 respectively and the props 3 and the upper plate 4 are fixed by a fixing means such as bolts and screws 20. Also, connection between the floor plate 2 and props 3 are fixed by the same way.

Besides, as shown in Fig. 1, an installation portion 7 in which a gasket 8 is installed is formed on the framework 9. This installation portion 7 is constituted of installation grooves 71 that are formed on side surfaces of the floor plate 2, the props 3 and the upper plate 4 which constitute circumferential edges of openings 5 formed between props 3 respectively, and arc-shaped housing grooves 10 formed along borderlines of connected portions 12 which are consisted of first connected portions between the floor plates 2 and the props 3 and second connected portions between the props 3 and the upper plate 4 respectively, wherein the installation grooves are connected via the housing grooves 10 respectively.

Then, as shown in Fig. 2, the gasket 8 is installed in the installation portion 7. The gasket 8 is unitedly constituted of side surface sealing portions 81 which are installed into the installation grooves 71 formed in the circumferential edges of the side opening portions 5 respectively and

connection sealing portions 82 fitting into the connected portions respectively as shown in Fig. 6.

As shown in Fig. 3, the vacuum chamber assembly 1 is assembled by fixing the side plates 6 for closing the side opening portions 5 to the framework 8 in which the gasket 8 is installed so as to press the gasket 8.

Besides, a peephole 30 as shown in Fig. 3 is formed in the side plate 6, and further, a piping mechanism for intake and discharge and a mechanism for wiring harness between a control unit and a sputtering device located inside thereof are provided (not shown in Figures).

Furthermore, the respective side surface sealing portions 81 of the gasket 8 is, as shown in Fig. 7, an approximate square in their cross section so as to engage to the installation grooves 71, so that top portions of it are deformed when the side plates 6 press them to crush into housing spaces 73 along side lines of the installation grooves. Thus, contacting faces between the top portions of the side surface sealing portions 81 and the side plates respectively are increased, so that a sealing level of these portions can be increased.

Moreover, as shown in Figs. 4 and 8, parts of the housing grooves 10 in the connected portions 12 are provided with projections 11 projecting along contacted surfaces respectively, and further the connection sealing portions 82 are provided so as to cover the projections 11 respectively. Concretely, housing concave portions 83 for housing the projections 11 are formed inside the connection sealing portions 82, so that sealing level in these portions can be increased because the projections 11 are engaged into the housing concave portions 83.

Besides, as shown in Figs. 4 and 5, in fixing portions for fixing between

the props 3 and the upper plate 4 or between the props 3 and the floor plate 4, leak from the fixing portions can be prevented by arranging ring-shaped sealing members (such as O-ring) 23 around the screws 20 for fixing respectively, covering the fixing portions by cover portions 21, and fixing the cover portions 21 by screws 22.

According to achieving thus constitution, it is possible to assemble the vacuum chamber on a spot such as a factory. Furthermore, since thermal deformation of plates and props are prevented because heat in welding or soldering, etc. is not yielded on the spot, so that a grinding operation or a cleaning operation can be omitted on the spot.

A working mode as shown in Fig. 9 is such that housing spaces 73 for housing deformation of the top portions of the side surface sealing portions 81 are formed along both side lines of the installation grooves 71. Since housing spaces 73A and 73B are provided on the both sides of the housing spaces 73, the side surface sealing portions 81 are crushed into the housing spaces 73A and 73B equally to be housed, so that a further effect such that bias of the gasket 8 can be prevented is gained.

Moreover, as shown in Fig. 10, a vacuum chamber assembly 1 (1A) with the above-mentioned constitution is connected with the same vacuum chamber assembly 1B by removing one of the side plates 6, being adjacent to the vacuum assembly 1B and fixing each other to be able to gain an inner space 50A larger than an inner space 50 in one vacuum chamber assembly. Besides, a frame with a same shape as the circumferential edge of an opening portion existed by removing the side plate 6 is arranged between the vacuum chamber assemblies 1A and 1B, it is preferred to connect both assemblies 1A and 1B via the frame. Thus, since a plurality of vacuum chamber assemblies 1 can be

connected in series, the vacuum chamber assembly 1 is very available in the case of extension of equipment in future.

As explaining the above, according to this invention, it is easy to transport parts to a working spot and it is possible to assemble it on the spot, because the vacuum chamber assembly is an assembly system by screws and so on. Furthermore, since heating operation such as welding or soldering which was carried out on the spot before is not carried out, additional treatment to heat deformation etc. and/or cleaning operation can be omitted. Due to these reasons, it can be coped with enlarging a device itself, simplifying of transport operation and simplifying of assembling operation can be achieved, and further, reducing costs can be achieved.

Since the gasket which is formed unitedly of parts for sealing the side surfaces and parts for sealing the connected portions are used, a sealing level in the connected portions can be increased, and further, the sealing level in the connected portions can be made sure according to the constitution such as to cover the connected portions.

Furthermore, the assembly can extend easily without decreasing sealing level by constituting by an assembly system.